

to say, with the sound and speech curves produced by the phonautograph, phonograph and gramophone, and by the observation of the movements of vibrating flames, discs and membranes. He also describes in great detail the harmonic analysis of such curves. The next part of the work is devoted to the perception of speech, and here we find a full description of the ear, a discussion of the theories of hearing now so much debated, and, lastly, a detailed consideration of what may be termed the psychology of speech, such as the perception of speech elements, the nature of speech ideas, the laws of association, more especially the special associations of speech and the formation of such associations. Dr. Scripture rightly sees that the discussion of the nature of language must not be concerned only with the vibrations that constitute the sounds of words, or with the physiological mechanism of the articulating organs, but must take into account psychical phenomena associated therewith.

The following section deals with the production of speech, and here we find by far the most complete account that has yet been written of the action of the larynx and the movements of the tongue and pharynx. Most ingenious are the methods for determining tongue contacts, or the exact position of the tongue and soft palate in articulate speech. Here also the author treats of the tones of the vocal cavities in connection with the vexed question of the nature of vowels, and in general he supports the views of Prof. Hermann. Last of all, we have a section on the factors of speech, in which Dr. Scripture deals with vowels, consonants, melody, rhythm, accent, &c. There are three valuable appendices, the second of which, being studies of speech curves, shows magnified tracings taken by the author from gramophone records of certain admirable recitations. These tracings are by far the best that have yet been obtained, and they are carefully analysed as to varying amplitude or intensity, pitch, and period or frequency. When one looks at the long series of waves representing the sounds of spoken words, as shown in these tracings, the ultimate analysis seems almost hopeless, and more sure progress would be made if an analysis were carried out of very simple monosyllabic sounds, such as "pat," "bat," "cat," &c. Dr. Scripture also gives a table of phonetic symbols, and there is an excellent index. There are full bibliographical references to the works of all who have contributed to experimental phonetics, and the only name we miss is that of Dr. Marage, of Paris, whose recent researches are of much interest and value were it only for the fact that he has succeeded in placing the theory of vowel tones in a concrete and simple form.

It is not easy to find fault with such a work as we are considering, which, in the way of thoroughness and clearness of exposition, may take its place alongside the "Sensations of Tone" of Helmholtz. An author must be allowed to work out his subject in his own way, and if we think certain parts, such as the description of the ear and of the larynx, and the phonetic discussion of sound fusion, might have been shortened, still Dr. Scripture may not be of the same opinion. We would also observe that in dealing with psychological phenomena (and the same fault may be found with some

physiologists as to the language they use in describing nervous phenomena) there is a tendency to make use of expressions which have a definite meaning in physics, but when applied to other phenomena they are words, mere words. Thus, at the beginning of chapter x., on speech ideas, we have the following sentences:—

"The current of thought in consciousness varies in its density from moment to moment. The regions of less-density may be used to divide off parts of greater density; such portions of greater density are what we usually term 'ideas' or 'thoughts.' Each denser portion of the speech current in consciousness is an 'auditory idea' or—as a matter of speech—a 'phonetic unit.'"

The use of the words "density" and "current" are liable to misconception; at all events, it does not appear to us that this mode of stating the case makes it any clearer. Altogether, however, this is a great book, and we congratulate the author on its production.

JOHN G. MCKENDRICK.

#### OUR BOOK SHELF.

*Notions fondamentales de Chimie organique.* By Prof. Ch. Moureu. Pp. 292. (Paris: Gauthier-Villars, 1902.) Price 7.50 francs.

THERE is nothing calling for special remark in this little compendium of organic chemistry. It belongs to a type of scientific literature with which we are thoroughly well acquainted in this country, and has been written for the use of elementary students as an introduction to this branch of the science. The six chapters deal respectively with preliminary theoretical notions, hydrocarbons, oxygen-containing compounds, nitrogenous compounds, organometallic compounds and heterocyclic compounds. This classification will be unfamiliar to English chemists, and although it may possess certain advantages, it necessarily results in the association of the most heterogeneous groups. With the exception of this arrangement, the work follows the usual course, and the subdivisions of the chapters bring out with sufficient clearness the family resemblances arising from similarity of chemical type. Of course, the great difficulty which all writers of these short manuals have to contend with is the compression of such an enormous range of subjects into a limited number of pages without distorting the perspective view of each branch. Every original worker—and M. Moureu's contributions to synthetical chemistry entitle him to a prominent position in this capacity—has a tendency, often quite unconsciously, to give undue prominence to his own branch of the subject or his own particular theoretical views, and this is a real danger from which the elementary student cannot be too carefully guarded. No fault can, however, be found with the work from this point of view, and the author has maintained a fairly uniform balance throughout. The short treatment of stereochemistry (12 pp.) is particularly lucid so far as it goes, although the author only leaves himself half a page for the stereochemistry of nitrogen and sulphur. On the whole, this manual, regarded as a descriptive treatise to be used in association with laboratory work and lecture-room attendance, may safely be commended to the class of students for whom it is written:—

"Ouvrir l'esprit de l'élève en l'initiant graduellement au mécanisme des transformations de la matière et en lui présentant les grandes lignes de la Science avec le relief qui leur convient, le préparer ainsi à suivre avec fruit un *Cours complet* et à faire un usage profitable des *Traité*s proprement dits, tel a été notre but, notre unique objectif

en écrivant ce petit ouvrage, que nous considérons comme une *Introduction à l'étude de la Chimie organique*" (Preface).

How refreshing must it seem to teachers in this country to meet with an elementary work on chemistry containing no reference to the "Syllabus" of any Board of Examinations.

R. M.

*Penrose's Pictorial Annual*, 1902-3. The Process Year-book. An Illustrated Review of the Graphic Arts. Edited by William Gamble. Pp. xvi + 136 and 56. (London: A. W. Penrose and Co., Ltd., 1902.)

THE present issue of this very handsome and interesting year-book forms the eighth volume of this useful publication. Year by year the progress made in process work is here recorded, and at each issue the high standard of excellence of this book is raised. The rapid strides made in three-colour work and its general application to technical and artistic subjects render the present volume of especial interest, and the editor has brought together numerous articles and reproductions which will give the reader, not only a good insight into the principles involved, but a general idea of the excellence of the finished pictures.

As in former volumes, the engraver, printer, publisher, &c., have all apparently vied with each other to produce the best work, and an examination of the book down to the most minute detail shows how completely each has succeeded in his task. Printed on "perfection quality art printing" paper, the type in the text, and the illustrations, appear at their best, and in each case useful details, such as description of the original process employed, name of printer, &c., are added. The illustrations are representative of the application of process work to all types of subjects, from blocks for catalogue illustrations, such as cut-glass objects, silver work, machinery, &c., to others as reproductions of oil paintings, landscapes, portraits, birds' eggs, &c.

Although little has yet been said about the text, the articles on the various topics will be found full of useful and interesting facts and experiences. The book will be found a valuable addition, not only to the library of the amateur or professional photographer or process worker, but to those who wish to choose between different processes as judged by the finished examples. As a simple picture book, it should have many admirers.

*The Zoological Record for 1901*. Edited by D. Sharp. (London: Zoological Society, 1902.)

YEAR by year, this invaluable publication increases in bulk, the present volume being considerably thicker than the one for 1900, as the latter was larger than its predecessor. The task of the editor and his staff is indeed a prodigious one, and the marvel is how it is completed year by year within the allotted time. That shortcomings must occur here and there is, as the editor admits, inevitable, but all concerned are to be congratulated that they are so few and far between. At the conclusion of his preface, Dr. Sharp suggests that before many years elapse the "Zoological Record" may come to an end, owing to its place being filled by the "International Catalogue of Scientific Literature." Unless, however, the latter undertaking progresses at a more rapid pace than at present seems to be the case, naturalists will sadly miss the regular appearance of the well-known russet volume shortly before Christmas, and it would be a thousand pities if the publication were discontinued before it became absolutely superfluous. Except a certain lack of uniformity between the different sections, to which we have called attention on a previous occasion, the volume before us is so carefully edited as to call for nothing in the way of criticism.

NO. 1734, VOL. 67]

## LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

### Biology in Universities.

IN connection with an editorial article on university development at the beginning of your issue of January 1, where you quote a pamphlet of mine called "A Survey of the Sciences," drawn up for the information of Governors of the University of Birmingham, I have received a contribution to the subject from Prof. Herdman, emphasising the separate inclusion of Biology in addition to the specific sciences of Zoology and Botany, and especially emphasising its vital importance in the scientific study of Medicine.

I would ask you, therefore, to print it as the opinion of a highly competent specialist.

OLIVER LODGE.

IN NATURE of January 1, p. 193, right-hand column, middle, between ARCHÆOLOGY and BOTANY, I should like to have seen:—

BIOLOGY:—The fundamental science of medicine—which may, in fact, be regarded as applied experimental biology.

It is, therefore, an essential part of the preliminary training of every medical student.

It is the central, or basal, area of the natural sciences, containing, as it does, the facts and principles which are common to, and undergo application and further elaboration in, the sciences zoology, botany, anatomy, physiology, pathology, bacteriology, anthropology, psychology and palæontology.

It is (or should be), moreover, a subject of general culture, with many interesting applications to ordinary everyday life; and is of primary importance in philosophy both on account of its historic connection with the work of Darwin, Herbert Spencer and Huxley—biologico-philosophic work the influence of which, not only upon science, but also upon many other departments of thought it is difficult to estimate—and also because of more recent developments in connection with heredity, reproduction, &c.

All this on the pure science or educational side. In its practical applications, biology has an enormous field before it in the future in connection with arts and industries, our food supplies, fisheries, drainage and the metabolism of the ocean—matters affecting the health of man and the prosperity of the country.

Some of these points were referred to under zoology or botany, but there is so much ground common to these two sciences, and they are so interwoven both in matters of theory and in practical applications, that it is desirable to recognise these relations under the heading biology.

W. A. HERDMAN.

University College, Liverpool, January 2.

### Genius and the Struggle for Existence.

IF the struggle for existence and survival of the fittest mean anything at all, they surely mean that any quality which is useful to the individual, or race, will be preserved and increased. Sir Oliver Lodge, however, in his "Survey of the Sciences," as reported in NATURE, January 1, says:—

"The struggle for existence, though doubtless a stimulating training for the harder and sturdier virtues, is not the right atmosphere for the delicate plant called genius."

But if genius is not evolved in the struggle for existence, then it is not an advantage. In the usual phraseology of natural selection, it is considered enough to say, "Such and such a quality, or organ, is useful, therefore it will be evolved in the struggle for existence."

If, then, Sir Oliver Lodge is right, either (1) genius is not useful, or (2) useful qualities are not—necessarily—evolved in the struggle for existence.

And if genius is—which I take leave to doubt—the tender greenhouse plant represented by Sir Oliver Lodge, is it worth while trying to preserve it in this—more than—bracing environment we call life? So far as I can gather from the figures given, the education of one whose discoveries will be of